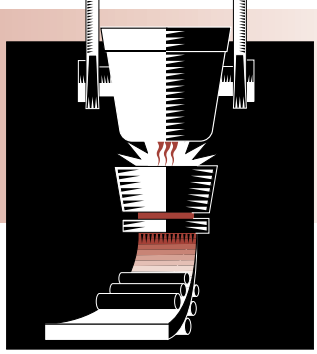
STEEL

Project Fact Sheet



Effect of Residuals in Carbon Steel

Benefits

- A state-of-knowledge survey of the information currently available on the effect of residuals in carbon steel
- Reliable data on levels of residuals that can be permitted consistent with required product performance to aid in setting specifications for modern steel grades
- Optimization of scrap recycling and charge control practices for steel production

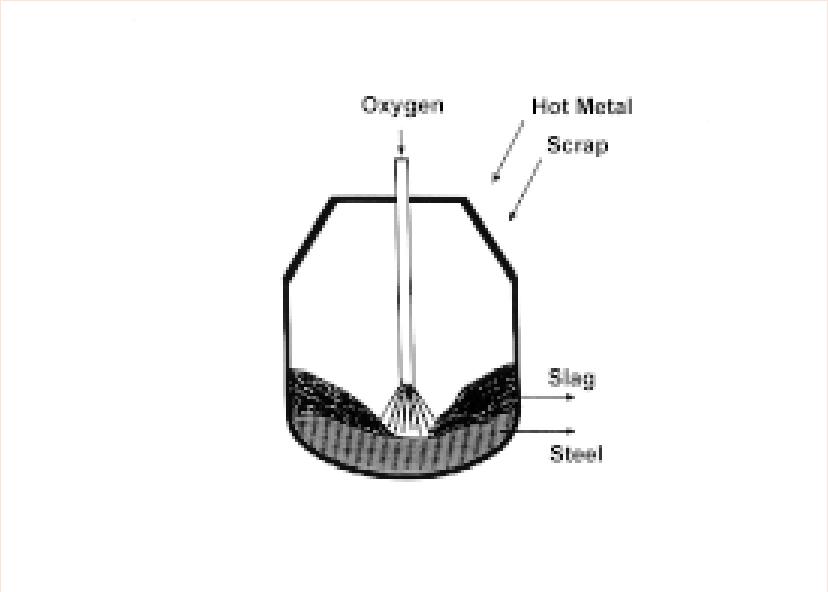
Applications

The study will help steel companies: 1) to select economical process routes to manufacture products with the required properties; and 2) to propose and specify meaningful values for the maximum allowable content of residual elements in steel products and recycled scrap charge.

The development of reliable data on permissible levels of residuals will optimize scrap recycling and charge control practices for steel production

The Department of Energy has partnered with the steel industry to develop processes to improve steel production efficiency. The steel industry uses scrap and other recycled materials, in addition to iron-ore based metallic materials, to produce molten steel for downstream processing. A good portion of the undesirable residual elements in liquid steel can originate from the recycled materials. Careful selection of charge materials to the steelmaking furnace is necessary to minimize and control these residual elements to acceptable levels. Steelmaking furnaces currently produce about 110 million tons of liquid steel for further processing. The total annual value of liquid steel is approximately $28 billion. Methods to improve the consistency and efficient operation of the steelmaking furnaces is of unquestioned value to the steel industry. Control of the quality of molten steel delivered by steelmaking furnaces is an extremely important requirement for profitable steel mill operations. Consistent delivery of the molten steel free from undesirable levels of residual elements is a key requirement for production of steel for many critical applications.

Furnace Charge



Production of molten carbon steel.

Development of Reliable Data (Continued)

During Phase I, the project will conduct a state-of-knowledge survey on the effect of residuals on hot ductility, scale formation and adherence, embrittlement and mechanical properties, weldability, corrosion properties, and galvanizing properties. During Phase II, two widely produced steel grades will be selected for characterization of hot ductility, scale formation and adherence, embrittlement and mechanical properties. If the project is continued into Phase III, the characterization study will be expanded to cover weldability and corrosion properties. The focus of this work will be on development of specifications for maximum allowable content of residual elements in steel products and in recycled scrap.

Project Description

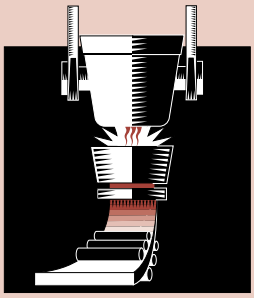
Goal: The project goal is to quantitatively investigate the effect of residuals on the quality and properties of a given steel chemistry with various combinations of tramp elements. The results of the study will permit the identification of practical limits of these residual (tramp) elements and possibly the extension of the existing practical limits by controlling processing parameters.

There are three primary objectives of this project: 1) during Phase I, develop a state-of-knowledge report on effects of residual elements on surface quality during casting and rolling processes and on final product properties of carbon steel. The survey will include effect of residuals on hot ductility, scale formation and adherence, embrittlement and mechanical properties, weldability, corrosion properties, and galvanizing properties; 2) during Phase II, two widely produced steel grades will be selected for characterization of hot ductility, scale formation and adherence, embrittlement and mechanical properties, and; 3) if the project is continued to Phase III, the characterization study will be expanded to cover weldability and corrosion properties.

This project will increase the reliability of the steel production furnaces for production of steel with permissible residuals content and will provide flexibility in the charge materials entering the steelmaking furnace. It will also increase recycling of steelmaking metallic materials, thereby, improving the environment and reducing steelmaking costs.

Progress and Milestones

- Project start date, February 1998.
- The survey on state-of-knowledge of effects of residual elements has been completed.
- The selection of steel chemistries to conduct Phase II characterization has been completed and characterization work was initiated, October 1999.
- All of 23 steel alloys (13 low-carbon and 10 medium-carbon) have been vacuum-melted, cast, hot-rolled to plate, and machined into test samples, October 2000.
- Experimental testing and characterization work is in progress.
- Project review meetings are planned for March and May 2001.
- Characterization study completion date, October 2001.



Project Partners

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American Iron and Steel Institute
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